



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,550	07/29/2003	Ashay A. Dani	884.842US1	7470
21186 7590 01/10/2007 SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			EXAMINER NGUYEN, THINH T	
			ART UNIT	PAPER NUMBER
			2818	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		01/10/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/630,550

Applicant(s)

DANI ET AL.

Examiner

Thinh T. Nguyen

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 13-19 and 26-48 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 13, 14, 16-19 and 26-48 is/are rejected.
- 7) ☒ Claim(s) 15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED OFFICE ACTION

1. Applicant's election of claims 13-19 and 26-48 for prosecution without traverse in the communication with the Office on 11/6th/2006 is acknowledged.
2. Claims 13-19 and 26-48 are pending in the Application. Applicant has cancelled claims 1-12 and 20-25.

Specification

3. The specification has been checked to the extent necessary to determine the presence of all possible minor errors. However, the applicant cooperation is requested in correcting any errors of which the applicant may become aware in the specification.

Claim Objection

4. Claim 17 is objected to for lacking antecedent basis. Claim 17 recites the limitation "wetting agent" in line 3. Claim 17 depends on claim 13 and there is no recitation of "wetting agent" in claim 13.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102(b) that form the basis for the rejections under this section made in this office action.

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claim 13,16-19,31-33,36,38,40,41 are rejected under 35 U.S.C. 102(b) as being anticipated by Bunyan et al. (WIPO WO 00/36893 PCT /US99/20750)

With regard to claim 13, Bunyan discloses a package (the abstract, fig 1) comprising: a die(fig 1 reference 12) ; a first heat sink;(fig 1 reference 24) a thermal interface Material (Fig 1 reference 30) disposed between the die and the first heat sink, the thermal interface material including: a matrix, (claim 7, page 13 lines 11-31,page 14 ,page 15) wherein the matrix exhibits a phase change between about 30.degree. C. and about 100.degree. C.; and a distribution of first interstitial heat transfer structures in the matrix(page 16 lines 1-16), including a size range from about 5 micron to about 25 micron(column 16 line 5) , and wherein the distribution of first interstitial heat transfer structures occupies from about 5 volume percent to about 95 volume percent of the composition(claim 7); and wherein the die is separated from the first heat sink by less than or equal to about 30 micron. (page 13 line 16).

Noted that phase change material by Bunyan has a phase transition about 40-to 80 Degree Celsius (claim 8) and the fillers or interstitial heat transfer structures ratio is between 20-80

Art Unit: 2818

(claim 7) percent with size from 0.25 to 250 micron (page 16 line 5) and the gap between the heat sink and the IC die is 25 to 500 micron (page 13 line 16) therefore, Bunyan correctly anticipated claim 13.

With regard to claim 16, Bunyan discloses a matrix material (page 14 lines 8 to 30) that includes acrylic (page 14 line 24).

With regard to claim 17, the Examiner assumes that the Applicant will correct the deficiency of this claim to overcome the objection by the Examiner and will examine the claim as best as it can be understood by the Examiner. Noted Bunyan anticipates this claim since Bunyan discloses a matrix material (page 14 lines 8 to 30) that includes acrylic (page 14 line 24). a wetting agent of about 15% (page 18 line 25-26). Also noted that Bunyan matrix phase change material composition is in the range of 20 % to 80% (due to the range of the composition of the filler is in the range of 20 % to 80%).

With regard to claims 18, 31 ; since Bunyan discloses the die can be an electronic component like microchip mounted on a substrate (page 12 lines 1-13) therefore the chip can be a bare die.

With regard to claim 19, 32 as set forth in the rejection of claim 18, Bunyan disclose a bare chip that can be used on computer and communication equipment (page 1) , therefore the bare die can include in a mobile device (noted that computer include laptop computer , a mobile device also noted that communication device include cellular phone, another mobile device)

With regard to claim 33, Bunyan discloses Aluminum Oxide as particulate filler and Aluminum Oxide is a dielectric.

With regard to claim 36, Bunyan discloses an article (the abstract, fig 1) comprising:

a die; (fig 1 reference 12) a first heat sink(fig 1 reference 24) ; and a thermal interface material (fig 1 reference 30) disposed between the die and first heat sink, the thermal interface material including:

a matrix including a first surface and a second surface that is parallel planar to the first surface, wherein the matrix exhibits a phase change between about 30° C and about 100° C, and wherein the first surface is separated from the second surface by less than or equal to about 30 micron; and a distribution of contiguous first interstitial heat transfer structures exhibiting a contiguous interstitial heat transfer structure path in the matrix, including a size range from about 5 micron to about 25 micron, and wherein the distribution of first interstitial heat transfer structures occupies from about 5 volume percent to about 95 volume percent of the composition.

Noted that phase change material by Bunyan has a phase transition about 40-to 80 Degree Celsius (claim 8) and the fillers or interstitial heat transfer structures ratio is between 20-80 (claim 7) percent with size from 0.25 to 250 micron (page 16 line 5) and the gap between the heat sink and the IC die is 25 to 500 micron (page 13 line 16) therefore, Bunyan correctly anticipated claim 36.

With regard to claim 38, Bunyan 750 discloses (pages 16 lines 17-30) a distribution of second interstitial heat transfer structures, wherein a portion of the distribution of second interstitial heat transfers includes one interface exposed at least one of the first surface and the second surface, and one interface exposed to at least one of the distribution of first interstitial heat transfer structures.

Noted that Bunyan 750 invention can have more than one fillers.

With regard to claim 40, Bunyan discloses that his matrix material can be acrylic
(page 14 lines 23-26)

With regard to claim 41, Bunyan discloses that his matrix material can be acrylic
(page 14 lines 23-26) with a wetting agent about 10-30 % (page 16 lines 24-30, page 17 lines 1-
2) with the matrix is present about 4 to 75 % and the interstitial structure are present about 5 to
95 %.

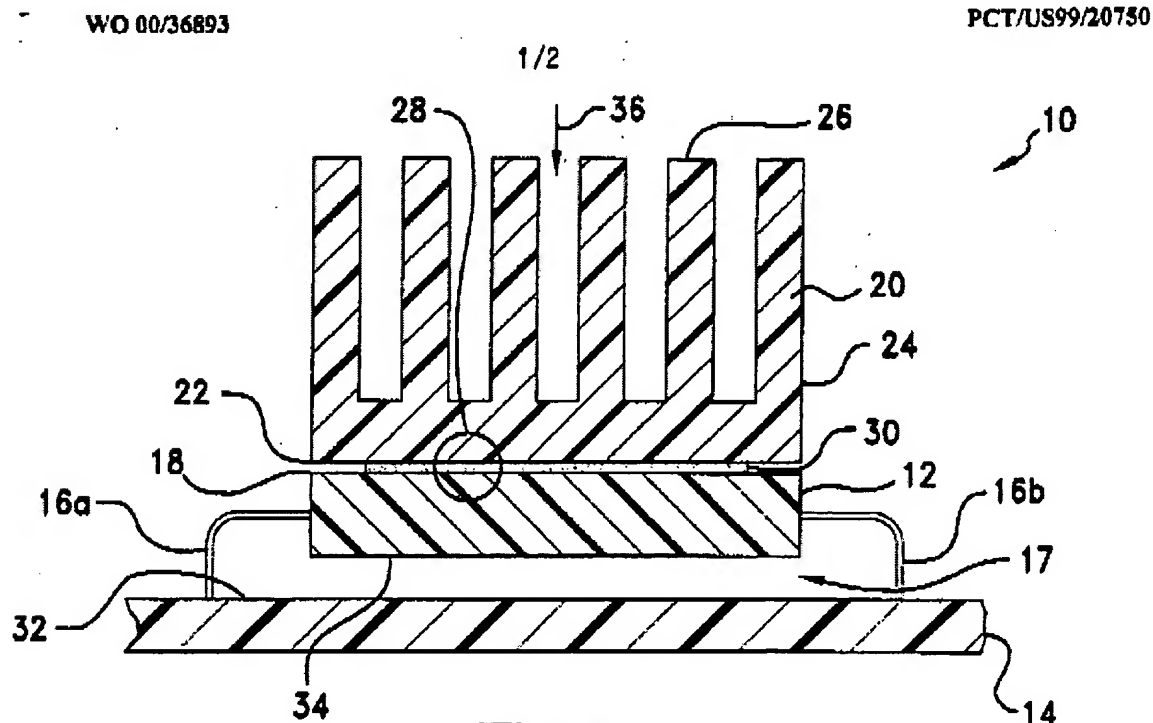


Fig. 1

Art Unit: 2818

7. For claims 26-30 and 42-44,47- 48 they are related to claims 13-19,31-35 and 36-41 as combination and sub-combinations because claims 26-30 and 42-44, 47- 48 are claiming computer systems while claims 13-19,31-35 and 36-41 are claiming a package or an apparatus to be used inside the computer system. Since the combinations depend on the subcombination for patentability, to avoid repetition, their rejection or allowability will be the same as the subcombination.

8. Claims 26-30, 42-44,47-48 is rejected under 35 U.S.C. 102(b) as being anticipated by Bunyan et al. (WIPO WO 00/36893 PCT /US99/20750)

With regard to claim 26 ,27,28, as set forth in the present Office Action paragraph 8,the rationale for rejection of these claims is the same as claim 13.

With regard to claim 29-30 , as set forth in the present Office Action paragraph 8 ,the rationale for rejection of these claims is the same as claims 18,19

With regard to claim 42,43; as set forth in the present Office Action paragraph 8 ,the rationale for rejection of these claims is the same as claims 18,19.

With regard to claim 44 , as set forth in the present Office Action paragraph 8 ,the rationale for rejection of this claim is the same as claim 33

With regard to claim 47 , as set forth in the present Office Action paragraph 8,the rationale for rejection of this claim is the same as claim 16

With regard to claim 48 , as set forth in the present Office Action paragraph 8 ,the rationale for rejection of this claim is the same as claim 17

Claim Rejections - 35 USC § 103

9. The following is a quotation of U.S.C. 103(a) which form the basis for all obviousness rejections set forth in this office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. claim 34,35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bunyan et al. (WIPO WO 00/36893 PCT /US99/20750) in view of Bunyan (US Patent Application Publication US 2003/0203188) .

with regard to claim 34, and as set forth in the rejection of claim 13, Bunyan 750 discloses all the invention of including a second filler (page 16 lines 4-24). missing in the disclosure of Bunyan 750 is the limitation wherein the distribution of second interstitial heat transfer structures includes a low melting-point metal.

Bunyan 188 however, discloses (in the abstract, in paragraphs [0020];[0042]; [0060]) Discloses a second filler (Bunyan discloses a mixtures or plurality of many fillers is possible) that includes a low melting-point metal (paragraph [0019]) .

It would have been obvious to one of ordinary skill in the art the time the invention was made to incorporate this feature as taught by Bunyan 188 into the Bunyan 750 package and come up with the invention of claim 34.

The rationale is as the following :

A person skilled in the art at the time the invention was made would have been motivated to lower thermal impedance and improve heat transfer performance of Bunyan 750 package as taught by Bunyan 188 in paragraph [0017].

With regard to claim 35, as set forth in the rejection of claim 34, the combined device temporary named device Bunyan 750 in view of Bunyan 188 discloses all the invention including a second interstitial heat structure (Bunyan discloses a mixtures or plurality of many fillers is possible in paragraphs [0020];[0042]; [0060]) except for the limitation wherein the distribution of second interstitial heat transfer structures is present in a greater weight concentration than the distribution of first interstitial heat transfer structures.

This feature ,however ; is considered obvious for the following rationale:

The selection of parameters such as **energy, concentration, temperature, time, molar fraction, depth, thickness, etc.,** would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in **energy, concentration, temperature, time, molar fraction, depth, thickness, etc., or in combination of the parameters** would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller* 105 USPQ233, 255 (CCPA 1955). See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re*

Art Unit: 2818

Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

11. Claims 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bunyan et al. (WIPO WO 00/36893 PCT /US99/20750) in view of Sachdev et al (US patent Application Publication US 20020000239 A1)

With regard to claim 14, as set forth in the rejection of claim 13, Bunyan 750 discloses all the invention except for a second heat sink disposed above the first heat sink . Sachdev, however, discloses (fig 2) discloses a package wherein a second heat sink (fig 2 reference 20 , paragraph [0069] is disposed above the first heat sink (fig 2 reference 16)

It would have been obvious to one of ordinary skill in the art the time the invention was made to incorporate this feature as taught by Sachdev into the Bunyan 750 package and come up with the invention of claim 14.

The rationale is as the following:

A person skilled in the art at the time the invention was made would have been motivated to provide the package by Bunyan 750 with extra protection and make it easier to rework as taught by Sachdev in paragraphs [0002] and [0069].

12. Claim 37,39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bunyan et al. (WIPO WO 00/36893 PCT /US99/20750)

With regard to claim 37, as set forth in the rejection of claim 36, Bunyan discloses all the invention except for the limitation wherein the contiguous first interstitial heat transfer structure path originates at the first surface and terminates at the second surface, and wherein the contiguous interstitial heat transfer structure path includes four or fewer interstitial heat transfer structures.

This limitation, however, is considered obvious for the following rationale:

The selection of parameters such as **energy, concentration, temperature, time, molar fraction, depth, thickness, etc.**, would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in **energy, concentration, temperature, time, molar fraction, depth, thickness, etc.**, or in combination of the parameters would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller* 105 USPQ233, 255 (CCPA 1955). See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmischer* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sola* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934).

With regard to claim 39, as set forth in the rejection of claim 36, Bunyan 750 discloses all the invention including a distribution of second interstitial heat transfer structures, wherein a portion of the distribution of second interstitial heat transfer structures includes one interface exposed at least one of the first surface and the second surface, and one interface exposed to at least one of the distribution of first interstitial heat transfer structures.

Missing in the Bunyan 750 disclosure is the limitation wherein the distribution of second interstitial heat transfer structures is present in a greater weight concentration than the distribution of first interstitial heat transfer structures (Bunyan discloses a mixture or plurality of many fillers is possible in paragraphs [0020]; [0042]; [0060]).

This feature of claim 39, however, is considered obvious since it has been held that where the general condition of a claim are disclosed in the prior art; discovering the optimum value or workable range involves only routine skill in the art,

13. For claims 45-46 they are related to claims 34-35 as combination and sub-combinations because claims 45-46 are claiming computer systems while claims 34-35 are claiming a package or an apparatus to be used inside the computer system. Since the combinations depend on the subcombination for patentability; to avoid repetition; their rejection or allowability will be the same as the subcombination.

14. claim 45,46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bunyan et al. (WIPO WO 00/36893 PCT /US99/20750) in view of Bunyan et al. (US Patent Application Publication US 2003/0203188) .

With regard to claims 45 and 46, as set forth in the present Office Action paragraph 14, the rationale for rejection of these claims are the same as claim 34,35

ALLOWABLE SUBJECT MATTER

15. Claims 15 is objected as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claim.

Claim 15 is considered allowable since the prior fails to teach the limitation :

-- “ a second heat sink disposed above the first heat sink; and a thermal interface material disposed between the first heat sink and the second heat sink, including:

a second heat sink matrix, wherein the second heat sink matrix exhibits a phase change between about 30° C and about 100° C; and a distribution of first interstitial heat transfer structures in the second heat sink matrix, including a size range from about 5 micron to about 1,000 micron, and wherein the distribution of first interstitial heat transfer structures occupies from about 5 volume percent to about 95 volume percent of the composition.”--

In combination with all other limitations of claim 15.

16. When responding to the office action, Applicants are advised to provide the examiner with the line numbers and the page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

17. A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to be abandoned (see M.P.E.P. 710.02(b)).

CONCLUSION

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thinh T Nguyen whose telephone number is 571-272-1790. The examiner can normally be reached on Monday-Friday 9:30am-6: 30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached at 571-272-1907.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval [PAIR] system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thinh T. Nguyen

Art Unit 2818

